PATENT SPECIFICATION

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Preservation of meat and the like.

COMPLETE SPECIFICATION

We, AMERICAN CYANAMID COMPANY, a corporation organized under the laws of the State of Maine, United States of America, of 30 Rockefeller Plaza, New York 20, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to food, its improvement and preservation. More particularly, the invention relates to the treatment of fresh cut meat whereby its quality and appearance are maintained over longer periods of time than would otherwise be the case.

The term "meat" is used herein to designate animal, fish or poultry flesh in general, with some exceptions within the scope of the above definition where the context requires that the material must be animal flesh, e.g. in the case where animal flesh of a specific type is named.

The control of meat spoilage is a major economic problem and is important from the standpoint of public health. Fresh cut meat displayed in retail outlets is subject to rapid bacterial spoilage and colour deterioration. Fresh meat especially when pre-packaged requires an environment of relatively high humidity in order to preserve a good colour appearance. If the humidity is too low, rapid surface drying is enhanced with accompanying browing or darkening of the exposed surfaces. On the other hand, subjection of the surface of meat to moisture enhances the opportunity for micro-organisms to multiply rapidly, thereby increasing the danger of spoilage. Further, it is virtually impossible under the usual conditions for handling, preparing and displaying pre-packaged fresh meat to prevent contamination of the surfaces of the meat with a multitude of microorganisms. As a result, it has usually been considered necessary to keep meat under refrigeration in large wholesale cuts for cutting and packaging at the retail outlet.

Obviously, from a commercial standpoint adequate means for controlling microbial spoilage and colour loss of fresh cut meat for longer periods of time than have heretofore been obtained would be highly desirable. It would permit delivery of consumer packaged meat instead of quarters or halves of carcasses thereby resulting in greater economy, better and more centralized quality control as well as less waste in terms of trimming losses. Furthermore, deterioration of meat in transit would be curtailed wherby meat with a longer shelf life would reach the ultimate consumer.

In view of the success of antibiotics in controlling the growth of many organisms, considerable attention has been directed toward the use of antibiotics for controlling meat spoilage. Various investigations have shown that when antibiotics, particularly the broad-spectrum antibiotics such as chlortetracycline, oxytetracycline and tetracycline, were applied to the surfaces of fresh meat, bacterial growth was inhibited. Further observations revealed that the shelf life of the meat so-treated was extended for several days.

Unfortunately, the shelf life of pre-packaged cut animal flesh is still not as long as desired and spoilage comes sooner than is desired. Also, there is a rapid deterioration of the bright red colour of most cut animal flesh which makes the meat undesirable to prospective consumers, even though the meat might still be sufficiently free from pathogenic microorganism as to be safely edible. Sometimes the texture and odour of fresh cut animal flesh deteriorates even though it may not be sufficiently spoiled to be inedible.

We have now discovered that we can enhance the refrigerated shelf life and

(Price 3s. 6d.)

organoleptic properties of colour, odour and texture of fresh cut meat without impairing its flavour for considerable periods of time by the conjoint application of an antibiotic of the type and kind to be more particularly described hereinafter and nystatin and/or myprozine so that from 0.5 to 500 parts per million of nystatin and/or myprozine based on the weight of the meat are retained thereon. (Myprozine is also known as pimaricin and is described in specification No. 846,933).

The antibiotics that may be used to advantage in practising the present invention should have as wide a bacterial spectrum as possible and be able to inhibit the growth of the bacteria that are generally encountered in spoiled meat. The antibiotic should be relatively stable under conditions found in meat, non-toxic and not adversely affect the colour or taste. The antibiotic should also be water-soluble to the extent that the quantities which are necessary for treatment can be applied in the form of an aqueous solution if desired.

Preferred antibiotics for use in the present invention are those of the tetracycline series, including chlortetracycline, bromotetracyline, oxytetracyline and tetracyline itself. Of these, chlortetracyline appears to have the most desirable properties. Other wide-spectrum antibiotics such as chloramphenicol may also be used to practice the invention. These antibiotics may be used in any of their water-soluble forms, usually as a mineral acid salt such as the hydrochloride. However, various other metallic salts such as the alkaline earth metal salts and the alkali metal salts may be used. Water-soluble complexes such as the borate or phosphate may also be used if desired.

In carrying out the present invention, an aqueous solution or substantially dry powder containing the antibiotic and nystatin and/or myprozine is first prepared. Although no adjustment of the pH of the solution is necessary, it is possible, if desired, to stabilize the solution with suitable buffering agents. The solution or dry powder is then applied to the exposed surface of the cut meat at about 40-50°F. Although application at ordinary room temperature is possible, we prefer that the treatment of the cut meat be carried out between 40-50°F. in order to minimize the possibility of an onset of bacterial development which may occur at ordinary room temperature. Application of the solution may be done by instantaneously dipping the exposed surfaces of the cut meat in the solution or, if desired, the solution can be sprayed on the exposed surfaces of the meat utilizing any mechanical sprayers, hand atomizers, or the like. Application may also be made to the exposed surfaces of the meat either mechanically or by hand using a substantially dry powder mix containing the antibiotic and nystatin and/or myprozine. However, in using the dry powder method of application, it is necessary that bulk carrier be added in order to effectuate an even distribution of the dry powder comprising the antibiotic together with nystatin or myprozine over all the exposed surfaces of the meat.

The carrier employed may be common salt, flour salt, which is a finely divided form of common salt, monosodium glutamate, starch, glucose and the like. The preferred carrier is common salt, although any edible powdered material which is inert to the meat and the antibiotic may be used.

If application is made by dipping or spraying, it is desirable to allow the cut meat so treated to drain for five to sixty minutes to remove the excess solution.

Following the treatment of the meat as described, the meat is then tray packed or placed on backing board, overwrapped in a suitable heat-sealable flexible film as, for example, polyethylene, coated "Cellophane" (registered Trade Mark) or the like and stored under refrigeration at about 35-40°F.

The amount of broad-spectrum antibiotic applied to the fresh cut meat should be from about 0.5 to 100 parts per million of the antibiotic, chlortetracycline, oxytetracycline, tetracycline, etc., based on the weight of the meat. This may be achieved by dipping the meat in an aqueous solution containing from about 6 parts per million to 1000 parts per million by weight of the antibiotic, or by spraying such a solution on the meat. When the antibiotic is applied by dusting a powder on its surface, the dry powder may contain from about 0.05 to about 10 percent by weight of the antibiotic.

The other active components of the treating composition, nystatin and/or myprozine, should be present in such concentration that from 0.5 parts per million to 500 parts per million by weight of the meat of these is retained on the meat as a result of the treatment. The aqueous solution in which the meat is dipped should, therefore, contain about 10 parts per million to 1000 parts per million by weight of nystatin or myprozine. If these two agents are applied as a dry powder with the antibiotic, the powder should contain 0.05 percent to a 10 percent by weight of these.

We have found that the conjoint application of an antibiotic as described herein and nystatin and/or myprozine gave results not foreseeable from the work previously reported in the prior art. We found that in treating fresh cut meat with such combinations, a synergistic action was obtained resulting both the extension of the refrigerated shelf line and retention of good organoleptic properties of the fresh cut meat

so treated for longer periods of time than has heretofore been accomplished.

The meat used in carrying out this invention was obtained from various wholesale outlets as hind and fore quarters and cut to approximately the same size as is generally sold for consumer use employing standard retail procedures.

The invention is applicable to the treatment of fresh cut meats in general, that is beef, pork, veal, and the like. Fish and poultry may be similarly treated if desired. Cured meats such as hams and various other specialty products may also advantageously be treated by the methods of this invention.

The invention will be described in greater detail in conjunction with the following specific examples. Unless otherwise stated, all parts are by weight.

EXAMPLE 1

Fresh boneless chuck meat was cut into approximately one inch cubes. The meat samples were divided into four groups having about 5 samples per group. Group I represents untreated meat and corresponds to the control. Group II represents meat containing 3 parts per million chlortetracycline hydrochloride based on the weight of the meat. Group III represents meat containing 3 parts per million chlortetracyline hydrochloride and 10 parts per million nystatin based on the weight of the meat. Group IV represents meat mixture containing 3 parts per million chlortetracycline hydrochloride and 10 parts per million myprozine based on the weight of the meat. The powder used to dust the cut meat contained approximately 0.15% by weight of chlortetracycline and 0.5% by weight nystatin or 0.5% by weight myprozine.

The treatment was carried out by applying the dry powder mix containing the desired concentrations to the exposed surfaces of the meat at the rate of 2 grams per kilogram of meat using a convention hand shaker. The portions of beef chuck were then double ground, prepared as patties, tray packed, overwrapped with water resistant coated cellophane and stored under refrigeration at about 36°F. for the duration of the experiment. Samples were removed periodically from each group and micro-organisms counts were made. Observations were made of the colour and general appearance of the samples. Samples for bacterial counts were prepared by homogenizing the sample of meat in a sterile blender containing sterile distilled water in an amount equal to three times the weight of the meat for three to five minutes.

Based on the micro-organism count and appearance, it was determined when the meat would be considered spoiled, that is to say unacceptable for consumer use because of the bacteria count and when it could be considered to be discoloured (change in colour sufficient to render the meat unacceptable to a customer for use for human consumption). Table I shows the number of days before spoilage and discolouration took place. In the case of spoilage, the test was not continued beyond the twenty-second day if the micro-organism count was still within acceptable limits, i.e., if spoilage had not yet occurred. This is indicated by the plus mark after the day number.

TABLE 1

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	7	5
II	Chlortetracycline hydrochloride 3 ppm	11	13
III	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Nystatin	22+	20
IV	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Myprozine	22+	22

The results of Table 1 show that when beef chuck was treated with combinations of chlortetracycline hydrochloride-nystatin and and chlortetracycline hydrochloride-myprozine an increase in shelf life of at least 15 and 11 days respectively obtained over untreated meat and meat treated with chlortetracycline hydrochloride alone. It is also shown that good colour appearance of the meat was maintained 15 to 17 days longer than the control and 7 to 9 days longer than the meat treated with chlortetracycline hydrochloride alone.

EXAMPLE 2

The procedure of Example 1 was repeated using fresh boneless beef chuck. In this series of experiments Group I represents untreated meat. Groups II and III represent meat containing 3 and 10 ppm respectively of substantially dry powdered nystatin based on the weight of the meat. The data obtained are shown in Table 2.

TABLE 2

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	6	4
II	Nystatin—3 ppm	8	8
III	Nystatin—10 ppm	8	6
IV	Chlortetracycline hydrochloride 3 ppm plus 3 ppm Nystatin	15	14
V	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Nystatin	15	14

The results of the table show that when beef chuck was treated with combinations of chlortetracycline hydrochloride and nystatin, an increase in shelf life of 7 to 9 days respectively was obtained over meat treated with nystatin alone and untreated meat. It is also shown that good colour appearance of the meat was maintained 10 days longer than untreated meat and from 6 to 8 days longer than meat treated with nystatin.

EXAMPLE 3

The procedure of Example 1 was repeated using fresh pork loin. The meat samples were divided into five groups as described in Example 2. The results are shown in Table 3.

TABLE 3

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	9	9
II	Nystatin—3 ppm	11	14
III	Nystatin—10 ppm	11	14
IV	Chlortetracycline hydrochloride 3 ppm plus 3 ppm Nystatin	21+	18
V	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Nystatin	21+	15

EXAMPLE 4

Fresh boneless beef chuck was cut into approximately one inch cubes. The meat samples were divided into four groups having 5 samples per group. Group I represents untreated meat. Group II represents meat containing 3 parts per million chlortetracycline hydrochloride based on the weight of the meat. Group III represents meat containing 3 parts per million chlortetracycline hydrochloride and 10 parts per million of nystatin based on the weight of the meat. Group IV represents meat containing 3 parts per million chlortetracycline hydrochloride and 10 parts per million myprozine based on the weight of the meat.

The treatment was carried out by spraying the solutions containing the desired combinations on the exposed surfaces of the meat at the rate of 2 millilitres per kilogram of meat using a hand-operated atomizer, e.g., one having a hand-operated bulb or bellows. The rest of the procedure was the same as described in Example 1.

The results obtained are shown in Table 4.

TABLE 4

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	10	5
II	Chlortetracycline hydrochloride 3 ppm	12	12
III	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Nystatin	12	17
IV	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Myprozine	17	17+

The results of Table 4 further illustrate that when the meat was treated with combinations of chlortetracycline hydrochloride and either nystatin or myprozine a pronounced increase in shelf life and maintenance of a good colour appearance was achieved over untreated meat and meat similarly treated with chlortetracycline hydrochloride alone.

EXAMPLE 5

Fresh beef round steak was cut into portions of about ¾ inch thickness and weighing aproximately one pound. The meat samples were divided into two groups having about 5 samples per group. Group I represents untreated meat and Group II represents meat containing 3 parts per milion chloretetracycline hydrochloride and 10 parts per million myprozine based on the weight of the meat. The rest of the procedure is the same as described in Example 1.

The results obtained are shown in Table 5.

TABLE 5

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	11	8
II	Chlortetracycline hydrochloride 3 ppm plus 10 ppm Myprozine	18	16

EXAMPLE 6

The procedure was the same as in Example 5 except that the spray method of application was used as described in Example 4. In this example, Group I represents untreated meat and Group II represents meat containing 100 parts per million chlortetracycline hydrochloride and 500 parts per million myprozine based on the weight of the meat.

The results obtained are shown in Table 6.

TABLE 6

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	8	9
II	Chlortetracycline hydrochloride 100 ppm plus 500 ppm Myprozine	19	20

EXAMPLE 7

Fresh beef round steak was cut into portions of about ¾ inch thickness and weighing approximately one pound. The meat samples were divided into two groups having about 5 samples per group. Group I represents untreated meat and Group II represents meat containing 20 parts per million chlortetracycline hydrochloride and 100 parts per million myprozine based on the weight of the meat.

The treatment was carried out by instantaneously dipping the meat in a four gallon vessel containing the solution of the desired concentration, drained for 5 to 10 minutes to remove any excess solution, placed on backing board, overwrapped with cellophane and stored at 36°F. for the duration of the experiment. The rest of the procedure is the same as shown in Example 1.

The results obtained are shown in Table 7.

TABLE 7

Group	Treatment Before Storage	Spoilage Time (Days)	Discolouration Time (Days)
I	Control (Untreated)	11	9
II	Chlortetracycline hydrochloride 200 ppm plus 100 ppm Myprozine	18	16

In the examples, nystatin and myprozine are shown as the only added materials in each formulation. They are, of course, equally effective if used in admixture but ordinarily this does not present any important advantage.

WHAT WE CLAIM IS:—

1. A method of preserving the quality and appearance of fresh cut meat which comprises contacting the surface of fresh cut meat with a broad-spectrum antibiotic and nystatin and/or myprozine so that from 0.5 to 500 parts per million of nystatin and/or myprozine based on the weight of the meat are retained thereon.

2. A method as claimed in claim 1, wherein the antibiotic is chlortetracycline.

3. A method as claimed in claim 1, wherein the antibiotic is tetracycline, oxytetracycline or chloramphenicol.

4. A method as claimed in any of the preceding claims, wherein the meat is immersed in an aqueous solution containing 6 parts per million to 1000 parts per million by weight of the broad-spectrum antibiotic and from 10 parts per million to 1000 parts per million by weight of nystatin and/or myprozine.

5. A method as claimed in any of claims 1 to 3, which comprises dusting over the meat surface a powder comprising a solid inert carrier and from 0.05 percent to 10 percent by weight of the broad-spectrum antibiotic and 0.05 percent to a 10 percent by weight of nystatin and/or myprozine.

6. A method as claimed in claim 5, wherein the inert carrier is finely divided sodium chloride.

7. A composition of matter for the preservation of fresh cut meat which comprises a mixture of an inert carrier and 0.05 percent to 10 percent by weight of a broad-spectrum antibiotic and 0.05 percent to 10 percent by weight of nystatin and/or myprozine.

8. A composition as claimed in claim 7, in which the inert carrier is water.

9. A composition as claimed in claim 7, in which the inert carrier is finely divided sodium chloride.

10. A composition as claimed in claim 7, in which the composition of matter is in a finely powdered form suitable for dusting.

11. A method of preserving the quality and appearance of fresh cut meat according to claim 1, substantially as hereinbefore described with reference to any of the specific Examples.

12. A composition of matter for the preservation of fresh cut meat according to claim 1, substantially as hereinbefore described with reference to any of the specific Examples.

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